

ble mineral substances which the soil contains, gives a measure of the directly nourishing capacity or fertility of a soil.

At the commencement of this century Theodore de Saussure already perceived the importance of soluble inorganic or mineral substances in soils in relation to the vegetation of plants, inasmuch as he considered them as directly nourishing substances, without which vegetable life could not exist. Before this time the gravest philosophers entertained the opinion that mineral matter in plants were only accidental circumstances, or, that if they were necessary, the plant had the power of transforming one into another, or indeed of creating them. They believe that there was something in the force of the vital principle, which could change iron into lime, lime into sand, or sand into potash, to supply the wants of the plant. The mineral theory was, however, attacked by many authorities, but recently it was brought to perfect proof by Wiegmann and Polstorff. These gentlemen have proved by direct experiments that plants will die if they cannot obtain the necessary quantity of mineral substances from their surrounding soil. The results of observations made by the Prince of Salm-Horstmar, in this matter are especially interesting, and may be given in the following summary: In a mixture containing all the various substances which are required by plants as nourishments, except silicic acid, plants of oats remained low, pale and dwarfish; without lime, they died after the second leaf; without potash and soda, they reached only a height of three inches; without magnesia, they remained weak and lying down; without phosphoric acid, very weak, but upright and of normal formation; without sulphuric acid yet weaker, upright and of normal formation, but without fruit; without iron, they remained very pale, weak and badly formed, and without manganese, they did not reach their full strength and showed but a few flowers. Soda could not represent potash in relation to the strength of the plants. Magnesia could not represent lime. If, however, all of the mineral substances which vegetable life requires were present in their proper proportion; and sufficient quantity, the plants of oats reached a complete and pretty luxurious development, even with an entire absence of humus or any vegetable substance in the experimental mixture.

As to the character of the solution in which those nourishing substances are absorbed by the plants, it has been stated by Bous-singault, that annually by a good crop of one hectare* about 200 kilogrs.† of soluble mineral substances are taken away. But during the growth of these reaped plants, about six millions kilogrs. of water were evaporated from the surface of their leaves; a quantity which previously was taken from the soil before it could evaporate from the leaves, and which always contained some soluble mineral substances in solution, which were left behind in the plants.

*One Hectare is about $2\frac{1}{2}$ acres.

†One Kilogramme is equal to $2\frac{1}{2}$ lbs.